

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : John Mantegna et al.
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Art Unit : 2155
Examiner : David R. Lazaro
Confirmation No.: 1607

Title : METHOD AND SYSTEM FOR DYNAMIC LATENCY MANAGEMENT AND
DRIFT CORRECTION

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Commissioner for Patents
P.O. Box 1450
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REPLY TO ACTION OF APRIL 6, 2006

Applicant asks that all claims be allowed in view of the following remarks. Claims 1-6, 8-16, 18-26 and 28-33 are pending, with claims 1, 11 and 21 being independent.

Claims 1-3, 5, 6, 8-13, 15, 16, 18-23, 25, 26 and 28-33

Claims 1-3, 5, 6, 8-13, 15, 16, 18-23, 25, 26 and 28-33 have been rejected under 35 U.S.C. §102(a) as being anticipated by Hodson ("Skew Detection and Compensation for Internet Audio Applications"). Applicant requests reconsideration and withdrawal of the rejection because Hodson does not describe or suggest the features of the independent claims. For example, Hodson does not describe or suggest determining a range for a size of a communication delay based on a measured communication delay of a receiving data buffer.

In general, independent claim 1 recites a method for dynamic latency management in a real-time electronic communication. The method includes measuring a communication delay arising from a receiving data buffer. The method also includes determining a latency adjustment necessary to adjust the size of the communication delay to within a predetermined range and determining a range for a size of the communication delay based on the measured communication delay. A number of samples of a playback data block passing through the receiving data buffer are modified based on the latency adjustment determined to be necessary to adjust the size of the communication delay and on the range determined for the size of the communication delay. Modifying the number of samples includes performing heuristic resampling of a playback block.

Thus, among other features, independent claim 1 requires measuring a communication delay and determining a range for an acceptable size of the communication delay based on the measured communication delay, where the acceptable size is used to adjust the size of the communication delay.

The Office action contends that Hodson describes determining a range for a size of the communication delay based on the measured communication delay. See Office action of April 6, 2006 at page 3 (citing page 2, 4th and last paragraph of § 2 and 1st paragraph of § 3 and pages 3-4, § 5). Applicant respectfully disagrees because (1) Hodson does not describe or suggest determining a range for a size of a communication delay and (2) Hodson does not describe or suggest determining such a range based on a measured communication delay.

In general, Hodson describes detection of, and compensation for, audible interruptions in audio streams due to unsynchronized clocks between a source and a receiving application. See Hodson at abstract. Samples are inserted into, or deleted from, the receiver's playback buffer to compensate for the audible interruptions that would otherwise be present. See Hodson at §§ 2 and 3. The number of samples to insert or delete is determined based on a skew compensation algorithm. See Hodson at § 1.

More particularly, Hodson describes adding an offset (referred to as a mapping offset) to each arriving packet in order to map the arriving packet from its source's time (e.g., the clock of the system that sent the packet) to the local time (e.g., the clock of the system that receives the packet). See Hodson at § 2. When the sender's clock is faster than the receiver's clock, packets will accumulate in the playback buffer and will be dropped from the stream when space is exhausted. See Hodson at § 1. When the sender's clock is slower than the receiver's clock, the playback buffer will run out of packets causing audio played out at the receiver to be interrupted. See Hodson at § 1. Any difference in the clock rates greater than the mapping offset is referred to as clock skew.

Hodson describes detecting clock skew by maintaining a running estimate of the mapping offset (m_i) and looking for divergence from the mapping offset assigned to the current packet stream (m_{Active}). See Hodson at § 2. When a significant divergence is detected (i.e., a large clock skew is present), Hodson applies a clock skew compensation algorithm. See Hodson at § 2.

1. Hodson does not describe or suggest determining a range for a size of a communication delay.

Hodson compensates for clock skew by attempting to maintain the playback buffer occupancy within a constrained region (e.g., an acceptable size of the playback buffer). See Hodson at § 2. Hodson describes low and high water marks (δ_L and δ_H , respectively) that define the lower and upper bounds of the constrained region. See Hodson at § 2. Accordingly, the low and high water marks of Hodson define an acceptable range of a number of samples within which Hodson attempts to maintain the playback buffer occupancy.

As such, Hodson describes a range of an acceptable size of a playback buffer. Hodson does not, however, describe a range for an acceptable size of a communication delay. Constraining the number of samples that occupy a playback buffer may aid in adjusting a communication delay or clock skew, but determining an acceptable size of a playback buffer is not the same as determining an acceptable size of a communication delay. Thus, Hodson does not describe or suggest determining a range for an acceptable size of a communication delay.

2. Hodson does not describe or suggest determining such a range based on a measured communication delay.

The Office action contends that Hodson describes determining the region to which the occupancy of the playback buffer is constrained (as defined by the high and low water marks) based on communication delays related to a playback buffer. See Office action of April 6, 2006 at page 3 (citing Hodson at page 2, 4th and last paragraph of § 2 and 1st paragraph of § 3 and pages 3-4, § 5). More particularly, the Office action contends that “the low water mark is described as being determined based on the ... communications delay related to the playout buffer” and the “high water mark determination is also in part based on the communications delay.” See Office action of April 6, 2006 at pages 6-7. However, applicant respectfully disagrees.

As described above, Hodson does not describe or suggest determining a range of an acceptable size of a communication delay based on a measured communication delay, but rather describes a range of an acceptable size of a playback buffer. However, even assuming *arguendo*

that Hodson does describe determining a range of an acceptable size of a communication delay, Hodson does not describe determining such a range based on a measured communication delay.

Rather, Hodson describes the range being defined by low and high water marks that are determined based on constant values associated with the playback buffer. See Hodson at § 5. More particularly, Hodson describes the low water mark being based on a threshold number of samples that must occupy the playback buffer before the buffer will run out of samples to play, thus causing interruptions in the streaming audio. See Hodson at § 5. Hodson also describes using a fraction of a playout delay as the threshold number of samples. See Hodson at § 5. The playout delay refers to a delay (in addition to the mapping offset described above) that is added to each arriving packet's time stamp to compensate for arrival time variation (jitter) and for variations in host scheduling. See Hodson at § 2. The playout delay is constant over the duration of the packet stream to avoid interruption. See Hodson at § 2.

Stated differently, the low water mark of Hodson's range is determined based on a constant delay that is added to the time stamp of an arriving packet. Hodson fails to disclose a relationship between the playout delay and the detected clock skew or a measured communication delay. Thus, Hodson's range, at least at the lower bound, is determined based on a constant value, rather than a measured communication delay of the playback buffer.

As noted above, the Office action contends that the high water mark of Hodson is "also in part based on the communications delay as well as the determined low water mark." See Office action of April 6, 2006 at page 7. Applicant also respectfully disagrees with this interpretation of Hodson.

Hodson describes the high water mark being dependent on an amount of delay and memory consumption the receiver is prepared to tolerate. See Hodson at § 5. Thus, like the low water mark, the high water mark of Hodson is determined based on a constant threshold value. As such, the high water mark is not determined based on a measured communication delay, as the Office action contends. The high water mark is also dependent on the low water mark, inasmuch as the high water mark is placed at a distance, having a fixed value of 200ms, from the low water mark. See Hodson at § 5. As described above, the low water mark is not determined based on a measured communication delay, and thus, the dependency of the high water mark on the low water mark does not remedy the failure of the high water mark, alone, to be based on a

measured communication delay. Thus, Hodson's range, at both the lower and upper bounds, is determined based on a constant value, rather than a measured communication delay of the playback buffer.

Therefore, (1) the range described by Hodson, and defined by the high and low water marks, is not a range of an acceptable size of a communication delay and (2) Hodson's range is not based on a measured communication delay of a receiving data buffer.

Accordingly, Hodson does not describe or suggest determining a range for a size of a communication delay based on a measured communication delay of a receiving data buffer, as recited in independent claim 1. For at least these reasons, applicant respectfully requests reconsideration and withdrawal of the rejection of independent claim 1 along with claims 2, 3, 5, 6, 8-10 and 31 that depend therefrom.

Independent claim 11 recites a computer program, residing on a computer-readable medium, having instructions for causing a computer to dynamically manage latency in a real-time electronic communication in a manner corresponding to that of independent claim 1, and independent claim 21 recites a computer system running programmed processes for doing the same. Accordingly, for the reasons noted above with respect to independent claim 1, applicant requests reconsideration and withdrawal of the rejection of independent claims 11 and 21 along with claims 12, 13, 15, 16, 18-20, 22, 23, 25, 26, 28-30, 32 and 33 that depend therefrom.

Claims 4, 14 and 24

Claims 4, 14 and 24, which depend from independent claims 1, 11 and 21, respectively, have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Hodson in view of the Examiner's Official notice, as evidenced by Cohen (U.S. Patent No. 5,825,771). As discussed above with respect to independent claims 1, 11 and 21, Hodson does not describe or suggest the features in the independent claims. Cohen, as relied upon by the Examiner in the Official notice, describes management of a playback buffer where measurements of the playback buffer are averaged. See Cohen at cols. 2-3 and col. 8, lines 18-27). Cohen, however, does not cure the failure of Hodson to describe or suggest the subject matter of the independent claims. Nor does the Office Action contend that Cohen does. For at least this reason, and based on their

dependency from independent claims 1, 11 and 21, applicant respectfully requests withdrawal of the rejection of claims 4, 14 and 24.

Conclusion

It is believed that all of the pending issues have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this reply should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

No fee is believed due. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: _____

6/6/06

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